

MINUTE ITEM
This Calendar Item No. C50 was approved as
Minute Item No. 50 by the California State Lands
Commission by a vote of 3 to 0 at its
8/24/06 meeting.

**CALENDAR ITEM
C50**

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08/24/06

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E. Gillies
V. Van Way

AS TRUSTEE OF THE KAPILOFF LAND BANK FUND, AUTHORIZE EXPENDITURE OF UP TO \$17,000 TO COMPLETE A PREVIOUSLY APPROVED DEMONSTRATION PROJECT FOR HAND-REMOVAL OF A NON-NATIVE, INVASIVE AQUATIC PLANT, EURASIAN WATERMILFOIL (*MYRIOPHYLLUM SPICATUM*), FROM EMERALD BAY, LAKE TAHOE, AND INITIATE ANOTHER SMALL PILOT STUDY USING A BARRIER CONTROL TECHNIQUE ON SOVEREIGN LANDS IN LAKE TAHOE, EL DORADO COUNTY

PARTY:

California State Lands Commission
100 Howe Avenue, Suite 100-South
Sacramento, CA 95825-8202

BACKGROUND:

In April 2005, the California State Lands Commission (CSLC), as trustee of the Kapiloff Land Bank Fund, authorized the expenditure of up to \$15,000 for a demonstration project to determine the feasibility of controlling and eradicating a non-native, invasive aquatic plant, Eurasian watermilfoil (*Myriophyllum spicatum* L.)(milfoil), from Emerald Bay, Lake Tahoe. This initial survey and removal demonstration project was designed in cooperation and in consultation with the Tahoe Regional Planning Agency (TRPA), California Department of Fish and Game (CDFG), Lahontan Regional Water Quality Control Board (Lahontan RWQCB), the State Department of Parks and Recreation (Parks) and the Tahoe Resource Conservation District (RCD). Prior to implementing the project, the CSLC staff obtained permits from the TRPA (Permit #20050562) and CDFG (SAA #2005-0087-R2), which remain valid until May 23, 2008, and December 31, 2010, respectively. The CSLC initiated the work in May 2005 and contracted with a diver/aquatic plant removal company (ACE Diving) to conduct a comprehensive survey of Emerald Bay and remove any infestation encountered during the survey. The survey found that the milfoil infested approximately one acre in Emerald Bay, comprising an estimated five cubic yards, or 3,000 pounds of biomass, concentrated in the southwest portion of the Bay.

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The removal and water quality monitoring during removal activity provided initial data on diver assisted hand removal effectiveness in Lake Tahoe and found water quality impacts to be insignificant. Project results indicate that diver hand-removal of plants, assisted by vacuum suction, is an effective technique. Although cost-intensive, it has proven useful in a dense but small infestation located in the southwest corner of Emerald Bay. However, since the removal occurred early in the growing season (May), much of the infestation was not fully detected because plants had not emerged and therefore were not removed as evident from follow-up surveys in Fall 2005. Approximately 6,000 square feet of milfoil remained at the site. Exhibit A provides the final report of the 2005 effort.

With funding still available from the initial removal work in 2005, ACE Diving was contracted to conduct a follow-up removal effort in June 2006, later in the growing season than during the 2005 effort. The 2006 effort included four-work days from June 19 to June 23. The four-day revisit found the milfoil infestation to be approximately 10,000 square feet, which the contractor cleaned out thoroughly, but not completely. Approximately 3,000 square feet of dense plant material remain. Staff recommends two more visits to affect a thorough, complete removal of the Emerald Bay infestation. Exhibit B contains a detailed description of the proposed work plan.

Staff proposes the following:

- 1) Complete one full pass of removal of all milfoil plant material from Emerald Bay by end of the 2006 season (September); and
- 2) Conduct a follow-up survey in late Spring/early Summer 2007 and remove remaining milfoil if necessary.

The work conducted in 2005 and follow-up work in 2006 received positive responses from all involved agencies. In particular, the Tahoe RCD, based on the initial results of the May 2005 treatment, is in process of securing a multi-year, \$463,000 grant to survey the entire Lake for non-native, invasive aquatic plant species and continue diver-assisted hand removal of milfoil in Emerald Bay as needed and other infested areas of Lake Tahoe, particularly the Ski Run Marina area. Funding for this grant would not be available until August 2007.

Staff believes that the 2005 and 2006 data have and will continue to provide resource and water quality agencies reliable information on which to base management decisions and develop objectives for the management of milfoil and other invasive aquatic plants in Lake Tahoe. Several agencies and organizations support continuation of the demonstration project and are currently working with CSLC staff to develop a

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Memorandum of Understanding to develop long-term management strategies for invasive aquatic plant species in Lake Tahoe. Agencies and organizations include the TRPA, CDFG, U.S. Army Corps of Engineers, Lahontan RWQCB, Nevada Division of State Lands, California Department of Parks and Recreation, Tahoe RCD, Department of Boating and Waterways, USDA Agricultural Research Service, Nevada Division of State Parks, U.S. Forest Service, Lake Tahoe Basin Management Unit, Nevada Department of Environmental Protection, California Tahoe Conservancy, League to Save Lake Tahoe, Lake Tahoe Diver's Conservancy, Tahoe Keys Property Owners Association, and University of Nevada Cooperative Extension (UNCE).

In addition to completing the removal efforts in Emerald Bay, CSLC staff is proposing that a portion of the proposed expenditure be used to fund a small pilot project using an alternative technique, bottom barriers, to control milfoil. Bottom barriers, also called bottom screening or benthic barriers, consist of the laying down and fastening of a durable, cloth-like material, such as burlap or black plastic mesh, tightly over the lake bottom, pressing aquatic plants down to the substrate, and denying them light and the gasses to survive. Exhibit B contains a detailed description of work and a brief process for using this type of control method. This pilot project would install bottom barrier material on approximately 3,000 square feet of infested sovereign lands in Lake Tahoe and evaluate the efficacy of this method and costs. This study would provide a comparison of efficacy and costs between diver-assisted hand removal of plants, assisted by vacuum suction, and the bottom barrier methods. Investigating this method would require consultation with the TRPA, CDFG, Lahontan RWQCB, and any other regulatory authority prior to funding and implementing this pilot project.

Staff of the Commission will oversee the entire operation and follow-up with all of the involved agencies.

PROJECT FUNDING:

Monies to continue funding the demonstration project are available in the Kapiloff Land Bank Fund, from a mitigation settlement awarded to the CSLC for the improvement of water quality in Lake Tahoe. \$17,000 is needed to continue the project. The removal and control of milfoil from Emerald Bay and other areas of Lake Tahoe offers the potential to substantially improve water quality in Emerald Bay and Lake Tahoe, and is, therefore, consistent with the intent of the fund reserve.

STATUTORY AND OTHER REFERENCES:

Public Resources Code section 8600 et seq.

EXHIBITS:

- A. 2005 Pilot Project Final Report
- B. Work Plan for 2006-2007

OTHER PERTINENT INFORMATION:

1. Pursuant to the Commission's delegation of authority and the State CEQA Guidelines (Title 14, California Code of Regulations, section 15061), the staff has determined that this activity is exempt from the requirements of the CEQA as a categorically exempt project. The project is exempt under Class 6, Information Collection; Title 14, California Code of Regulations, section 15306.

Authority: Public Resources Code section 21084 and Title 14, California Code of Regulations, section 15300.

2. This activity involves lands identified as possessing significant environmental values pursuant to Public Resources Code sections 6370, et seq. Based upon the staff's consultation with the persons nominating such lands and through the CEQA review process, it is the staff's opinion that the project, as proposed, is consistent with its use classification.

RECOMMENDED ACTION:

IT IS RECOMMENDED THAT THE COMMISSION:

CEQA FINDING:

FIND THAT THE ACTIVITY IS EXEMPT FROM THE REQUIREMENTS OF THE CEQA PURSUANT TO TITLE 14, CALIFORNIA CODE OF REGULATIONS, SECTION 15061 AS A CATEGORICALLY EXEMPT PROJECT, CLASS 6, INFORMATION COLLECTION; TITLE 14, CALIFORNIA CODE OF REGULATIONS, SECTION 15306.

SIGNIFICANT LANDS INVENTORY FINDING:

FIND THAT THIS ACTIVITY IS CONSISTENT WITH THE USE CLASSIFICATION DESIGNATED BY THE COMMISSION FOR THE LAND PURSUANT TO PUBLIC RESOURCES CODE SECTIONS 6370, ET SEQ.

AUTHORIZATION:

AS TRUSTEE, AUTHORIZE THE EXPENDITURE OF UP TO \$17,000 FROM THE KAPILOFF LAND BANK FUND TO CONCLUDE THE MILFOIL REMOVAL DEMONSTRATION PROJECT IN EMERALD BAY AND TO INITIATE AND

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EVALUATE ANOTHER PILOT PROJECT USING AN ALTERNATIVE TECHNIQUE
TO CONTROL MILFOIL IN LAKE TAHOE.



PILOT PROJECT
EURASIAN WATER MILFOIL REMOVAL FROM EMERALD BAY
CALIFORNIA STATE LANDS COMMISSION
MAY 22-25, 2005

I. INTRODUCTION

During a meeting on November 18, 2004 at the Tahoe Regional Planning Agency (TRPA), the California State Lands Commission (CSLC) presented the pilot project to remove Eurasian watermilfoil (*Myriophyllum spicatum*) from Emerald Bay using the diver assisted hand removal method. ACE Diving, who would be the CSLC contractor to conduct the removal, was present via telephone to describe the methodology, costs, and to answer any agency concerns. Representatives from California Department of Fish and Game (CDFG), California Department of Parks and Recreation (CDPR), TRPA, Lahontan Regional Water Quality Control Board (Lahontan RWQCB), U.S. Department of Agriculture (USDA), and Tahoe Keys Property Owners Association (TKPOA) were present at the meeting. Issues presented at the meeting included potential turbidity from the method, monitoring protocol, and costs. The water quality standard required by TRPA and Lahontan RWQCB is not to exceed 3.0 NTU. ACE Diving did not believe that turbidity would present a significant problem.

The meeting also acknowledged that Eurasian watermilfoil is not the only threat to Lake Tahoe (the Lake), that curlyleaf pondweed (*Potamogeton crispus*) is a new aquatic pest needing immediate attention. It was agreed that aquatic weeds in general pose a threat to the quality of the Lake. However, the CSLC stressed that it is important to begin proactively treating infested areas of the Lake, which was the purpose of the Emerald Bay pilot project.

Following the meeting, the CSLC and ACE Diving prepared a project description for the pilot project, which was presented and submitted to the permitting agencies in March and April, 2005. The project was also presented to the Interagency Shorezone Committee on May 19, 2005, and the Interagency Weed Coordinating Group May 12, 2005. CDPR requested CSLC to complete the work prior to Memorial Day holiday weekend, the beginning of the summer recreation period during which increased vessel traffic could conflict with activities of the proposed Eurasian watermilfoil removal project.

On May 22-25, 2005, the CSLC's Contractor A.C.E. Diving (ACE) conducted the pilot project to remove Eurasian watermilfoil (*Myriophyllum spicatum*) from Emerald Bay. The project objective was to demonstrate the efficacy, impacts and cost of vacuum-assisted diver hand-removal of invasive submerged aquatic plants. Research data from this pilot demonstration will contribute data about this method of control for the public, resource managers and water quality managers to encourage the development of an effective, environmentally sound plan for the management and prevention of future invasive aquatic weeds in the Lake.

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CSLC staff thanks all agencies and their staff who helped bring about this project and meet its deadlines, including CDPR, CDFG, TRPA, the Shorezone Committee, Lahontan Water Quality Control Board (Lahontan RWQCB), Tahoe Keys Homeowners Association and Marina, the Tahoe Research Group, South Tahoe Refuse, Inc., and the Tahoe Weed Coordinating Group. CSLC also gives special thanks to the USDA Aquatic Lab Research group, under Dr. Lars Anderson, who monitored turbidity and other water quality parameters during three days of Eurasian watermilfoil removal.

Study Objectives

As provided in the project description, CSLC staff initiated this demonstration project to:

1. Demonstrate the effectiveness of diver assisted hand removal of Eurasian watermilfoil in Emerald Bay;
2. Assess temporal environmental impacts of the removal method and demonstrate the potential long-term benefit to water quality and beneficial uses;
3. Display the range of costs for this level of control of a light infestation;
4. Inform agencies on specific details of Eurasian watermilfoil weed control methods;
5. Involve the public and resource agencies with opportunity to coordinate responsibilities and stakeholder actions;
6. Supply additional data to inform agencies in planning and managing aquatic weeds in Lake Tahoe and setting reasonable conditions for tracking and monitoring weed management activities in Lake Tahoe and the Truckee River basins;
7. Provide information to assist in the development of long-term Eurasian watermilfoil management strategy/plan for the Lake.

II. DEMONSTRATION PROJECT

A. Permitting, November 2004 To May 2005

As stated above, the CSLC staff met with the TRPA and the Lahontan RWQCB staff to discuss a proposal to remove Eurasian watermilfoil in Emerald Bay in 2005. In November 2004 the CSLC contacted ACE, a diver/aquatic plant management company about work on the pilot Eurasian watermilfoil removal project, then sought to identify a potential funding source. After obtaining approval from the State Lands Commission (the Commission) to use the Kapiloff Trust funds set aside for water quality improvement in Lake Tahoe, CSLC circulated a draft Project Description to agencies that had expressed interest or concerns.

Working with the CDPR and South Tahoe Refuse, Inc., CSLC staff prepared the Eurasian watermilfoil removal project in Emerald Bay. The CSLC leases the submerged lands of the Emerald Bay to CDPR, and proposed to use Boat Camp pier facilities as a staging base. In order to allow CSLC to conduct the project on CDPR uplands, CSLC asked CDPR, the upland owner, to approve and sign the Tahoe Regional Planning Agency Application in March 2005. Initially CDPR granted access to the upland site(s) for workboat storage and deposition of collected material for subsequent disposal out-of-basin. CDPR denied disposal of collected Eurasian watermilfoil to its upland property

over concerns of regulatory uncertainties. During this time, CDPR, manager of state lands in Emerald Bay, established logistic points and assigned staff to coordinate and monitor project activities. On April 26, 2005, CDPR granted final approval for access and returned the signed TRPA application to CSLC staff, who immediately relayed it to TRPA.

Anticipating a possible volume of up to 30 cubic yards of collected fresh Eurasian watermilfoil biomass within the planned four days of removal, CSLC contacted South Tahoe Refuse, Inc. to arrange for collection and haul-out from the basin on the projected dates. South Tahoe Refuse walked the site with CDPR to ensure accessibility, and recommended 6-yard bins, or dumpsters, for disposal.

The CSLC circulated a draft Project Description. Three permitting agencies, CDFG, TRPA and Lahontan RWQCB, requested the CSLC to apply for permits. In February 2005 TRPA advised CSLC of the need to fill out an application. In March, after review of the draft Project Description, CDFG requested CSLC to submit a Lakebed Alteration Agreement application. Lahontan RWQCB staff expressed concerns over the project's potential to generate turbidity at the point of removal. Since historical monitoring data in Lake Tahoe were not readily available, CSLC staff proposed monitoring turbidity during the removal process. In January 2005, the CSLC canvassed the Lahontan RWQCB, the Tahoe Research Group, the Desert Research Institute, and USDA Aquatic Research lab for turbidity monitoring during the demonstration removal effort. In the first week of May, the TRPA indicated that the application was incomplete, and requested the CSLC to resubmit a second application, indicating which submissions would be required in this project. The CSLC immediately prepared a second submission for the following week. During the second week of May, 2005 the USDA Aquatic Research Laboratory came forward with the offer of assistance for the turbidity monitoring component. TRPA issued the one-time permit on May 23, 2005.

B. Underwater Survey and Preparation for Removal, May 22, 2005

On May 22, 2005, A.C.E. Diving (ACE), a diver/aquatic plant management company contracted by the CSLC, surveyed underwater for Eurasian watermilfoil, primarily within the upper 25 foot contour of Emerald Bay, as the preliminary task to scheduled Eurasian watermilfoil removal. The workboat launched from Tahoe Keys Marina, and taxied to the work site within 45 minutes. Underwater diving survey in waters of high visibility such as Lake Tahoe was expected to be successful. A single diver with a continuous air-supply unit and an underwater tow machine covered most of the susceptible substrate in Emerald Bay within 6 hours.

ACE skimmed over cobbles and other lake bottom that did not show any submerged vegetation, then swam slowly over vegetated patches, and stopped to identify plants and locate waypoints on GPS, as reported in Table 1.

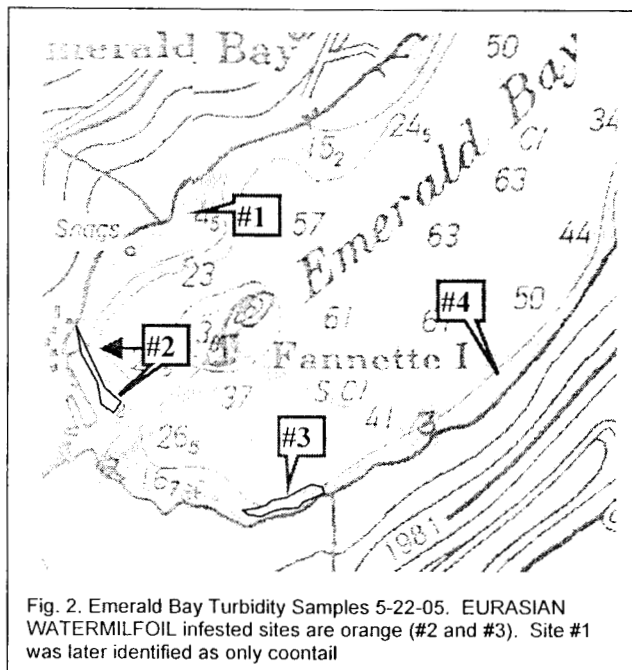
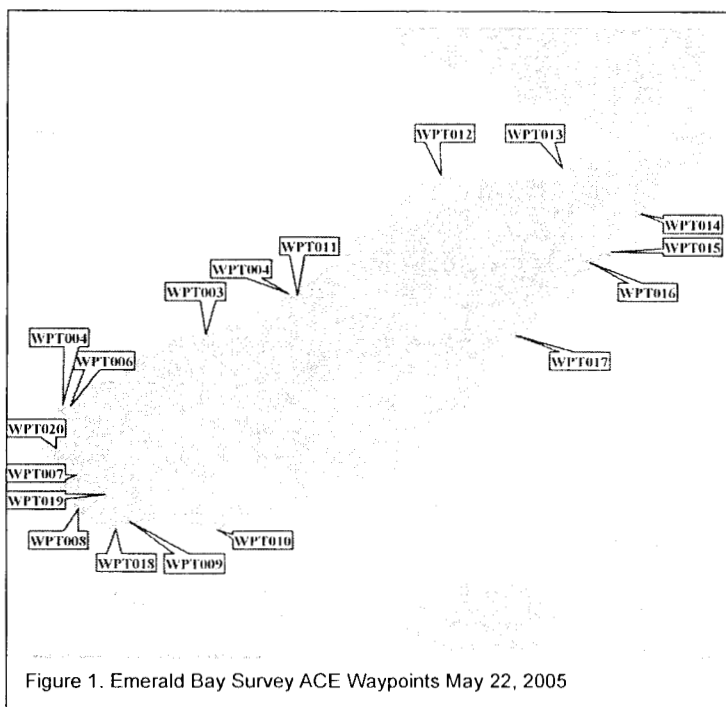
- ACE pinpointed three main sites of Eurasian watermilfoil plants (Figure 2., Sites #1, #2, #3), for removal, estimating roughly under 2 acres of area to be worked, under 6 yards volume to be collected, and a low biomass gross weight due to the short plant size. The survey detected no flowering or seeding milfoil plants. Due to the timing of

the growth season the Eurasian watermilfoil plants were small, averaging 8-12" height, their shortness promising a fairly easy collection.

- ACE observed Eurasian watermilfoil plants intermixed with native or hybrid milfoils (*Myriophyllum sibiricum*, *Myriophyllum spp.*, and coontail (*Ceratophyllum demersum*). ACE did not detect another invasive, curlyleaf pondweed (*Potamogeton crispus*) that has been detected nearby in South Lake Tahoe. As the season advances, Eurasian watermilfoil may top the other milfoils, and thus be more easily distinguishable. ACE noted that most of the EWM occupied Site #3.
- ACE detected no plants east of 38°57.574N 120°05.778W and 38°56.980N 120°06.088W on the north and south shores respectively. Coincidentally, the lake bottom east of these waypoints becomes rocky, turning into cobblestones and larger rocks towards the mouth of the Bay. Although shallow sloped on the northwest shore especially, this type of substrate is not likely to support EWM infestation.
- ACE recommended starting just north of the Tahoe Yellow Cress (TYC) Restoration Project area (Site #3), the largest and densest green patch, approximately 300' by 50', and following with the swimming area (Site #2) or the north beach (Site #1) if time allowed. Swimming area EWM, mixed in with coontail, lightly dotted a 100' by 50' section (Fig. 2.).
- Because of small EWM plant size, ACE projected that the collection volume and weight (biomass) would be low. After completion of the survey at end of day, ACE provided a brief table of waypoints, findings, and the priority sites for removal work the next three days (Table 1.). ACE recommended starting on the largest infested site, 5-15' depth, immediately north of the Land Re-vegetation Project, waypoint 38°57.023N 120°06.301W, see Table 1 below. CSLC staff presented these data the following day for permit issuance from the TRPA for project go-ahead.

Table 1. EMERALD BAY SURVEY 5-22-05

GPS COORDINATES	COMMENTS	TURBIDITY NTU
38°57.458N 120°05.992W	STATE PARK PIER	1=0.9, 20=18.8
38°57.574N 120°05.778W	PARSON ROCK -SANDY BOTTOM FROM ST.PARK PIER TO HERE NO PLANT LIFE	
38°57.105N 120°06.295W	FIRST PLANT SAMPLE FIRST BASELINE WATER SAMPLE, 2 METER DEPTH SWIM AREA AT VIKINGSHOLM EURASIAN WATERMILFOIL	2.6, 2.8 NTU
38°57.023N 120°06.301W	SECOND BASELINE WATER SAMPLE BAND OF EURASIAN WATERMILFOIL APPROX. 100' WIDE	0.6 NTU
38°56.980N 120°06.188W	SECOND PLANT SAMPLE, just N. of TYC Restoration Project EURASIAN WATERMILFOIL/DENSE -SHORT, MIXED WITH POSSIBLE NATIVE. THIRD WATER SAMPLE 2 METER DEPTH	0.6 NTU
38°56.980N 120°06.088W	100' EAST OF LAST WAYPOINT, NO PLANTS AT 2M	0.3 NTU
38°56.960N 120°05.958W	NO PLANT LIFE STEEP DROP OFF	
38°57.861N 120°05.406W	BIG ROCK BOTTOM WEST OF FANNETTE	
38°57.895N 120°05.107W	NEAR ENTRANCE OF BAY - NO PLANT LIFE	
38°57.801N 120°04.934W	START SURVEY EAST SIDE OF SOUTH SHORE	
38°57.692N 120°05.003W	OSPREY NEST SOUTH SHORE-NO PLANTLIFE	
38°57.675N 120°05.047W	FOURTH WATER SAMPLE - 3 M AND 4 M DEEP	
38°57.477N 120°05.229W	DOME ROCK - NO PLANT LIFE RETURN CROSSING NORTHWEST BACK TO PARK PIER	



C. May 23, 2005 – EURASIAN WATERMILFOIL REMOVAL DAY 1

The ACE diver entered the water after USDA finalized preliminary turbidity monitoring at approximately 11:30 a.m. (please see attached USDA Report), beginning just north of the Tahoe Yellow Cress Revegetation Project, Site #3, 38°56.971N 120°06.210W, loosening and pulling plants with one hand while with the other positioning the hydraulic suction hose approximately one foot above the substrate and taking in the detached plants. The material sucked into the hose exited approximately 8 inches under the water surface into a screened trap box attached to the hull of the workboat. The trap screen (approx. 1/8" sieve) allowed for continuous hand-transfer to 17 gallon plastic containers by the boat tender with a small grab fork, eliminating the need for the diver to surface. Harvested plant material stayed in the box while smaller particles of sand and silt passed through the screen. The diver worked an average 5-15 feet from the workboat.

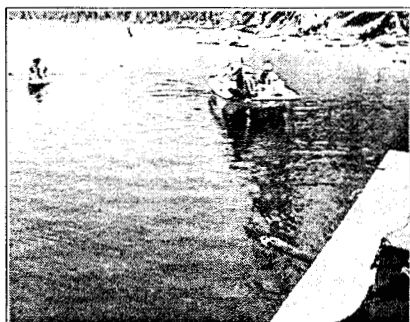


Fig. 3. Looking East, laying turbidity monitors off workboat

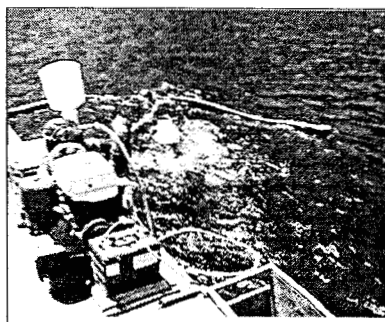


Fig. 4. Diver in water moving intake hose out



Fig. 5. Removing EWM from screen box

ACE Workboat staff tended the motors, took GPS readings and transferred collected plant material to the 17-gallon bins (pictured).

USDA placed YSI datasondes in Sites #2 or #3 (Figure 3), approximately half a meter above the lake bottom, before start of removal. USDA also monitored with the portable YSI unit from their workboat during the 3 days of removal (USDA report).

At day's end, ACE poured all collected plant material from the workboat bins into two 20-gallon 3-mil plastic bags, which were carried off the workboat and placed inside the USDA vehicle for same-day transfer to the USDA Aquatic Lab, UC Davis, for fresh and dry weight determinations. Because all material collected was transferred entirely to the USDA for analysis, ACE elected to use Tahoe Keys Marina launch and overnight facility for the workboats. The State Parks Boat Camp Pier served principally restroom access and parking/ pickup for visiting support staff, and fragment kayak put in and take out.

CSLC staff had picked up and bagged separately the free-floating Eurasian watermilfoil fragments that were not entrained by the diver removal operations, and turned these over to the USDA Aquatic Lab at end of operations.

Figures 3-7 show removal activities in Site #3, southeastern Emerald Bay, where the largest and densest populations of *M. spicatum* were detected, the focus of operations for removal on days 1 and 2. On the west side of Site #3 lay a "debris field" of fallen trees/ branches/ trunks beneath at an average 8'-12' depth in which some *M. spicatum* had become established.

Mixed in the *M. spicatum*, Site #3, were several other macrophytes, including a native or hybrid milfoil, *M. sibericum*, *Myriophyllum spp.*. Because of the intergrowth of plant stems within the underwater plant canopy, EWM removal incidentally captured some stems of associated non-target plants. CSLC staff estimates roughly 10% of the total biomass to be non-target aquatic plants taken out during removal. Since no underwater plant species was identified as threatened or endangered, and the remaining canopies appeared relatively healthy, elimination of such plants intermixed with the EWM did not present any noticeable impact.

D. May 24, 2005 -- WATERMILFOIL REMOVAL DAY 2

The ACE diver entered the water after USDA finalized preliminary turbidity monitoring with a background of 1.1 NTU, at approximately 11:30 a.m., beginning just north of the Revegetation Project, Site #3, 38°57.047N 120°06.227W. Before removal start on Day 2, ACE fastened black plastic around the collection box. During removal the resulting turbidity values at similar sampling points were slightly lower in the aggregate and ranged more closely, though still exceeded 5% regularly. In all instances, values returned toward

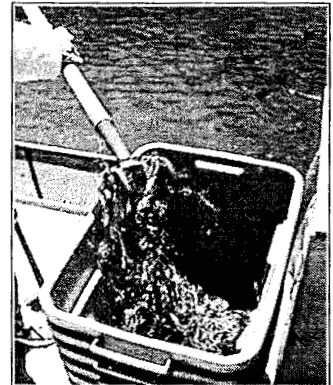


Fig. 6. EWM transfer into 17-gal bin on boat



Fig. 7. Haul from Day 1

the baseline within 30 minutes or less. Readings ranged from 0.1 to 1.0 NTU until ACE finished the area at 2:40 p.m.

ACE resumed 2:50 p.m. at Site #2, the Swim area, 38°57.185N 120°06.383W, starting with a baseline of 0.3 NTU. There were very few plants detected, and removal ended at 3:00 pm., with a final turbidity reading of 0.4 NTU.

E. May 25, 2005 -- WATERMILFOIL REMOVAL DAY 3 (LAST)

ACE and USDA conducted a short final day, working Site #3 again for just under two hours. This day a large portion, possibly up to half the collection, comprised hybrid or native milfoils. ACE recleaned the area under the fallen logs. Turbidity readings were low. Recheck just north of the Vikingsholm pier, a 5 minute suction, reconfirmed that the majority of plants are coontail, *Ceratophyllum demersum*, bringing collection pilot work at Emerald Bay to an end.

ACE packed up collected material from the previous two days into three plastic bags for hand-over to USDA for transport to UC Davis. ACE surveyed the mouth of Tahoe Keys Marina, confirming presence of Eurasian watermilfoil by the third set of buoys coming from the marina. Next, ACE briefly visited inside Ski Run Marina and observed filamentous algae and, outside by the jet-ski pen, curlyleaf pondweed (*Potamogeton crispus*). These are plants of concern and ACE will recommend prompt action on a subsequent effort.

III. WATER QUALITY MONITORING

On Day 1 of Removal, USDA deployed two YSI Sondes (datasondes). USDA placed one datasonde down-current from Site #3 operations, anchoring it to the bottom and suspending it via a buoy approximately 0.5 m from the bottom, and programmed it to collect data at 20 minute intervals. The datasonde instruments measured several water quality parameters, including time, turbidity to tenths (0.1) of a nephelometer turbidity unit (NTU), temperature (C), dissolved oxygen (Mg/l) depth (m) and pH. USDA installed another datasonde for 2 hours at the adjacent "swimming beach" area (Site #2) in a similar manner, 2.5 hours before the start of removal operations, to serve as an "out-of-plot baseline" reference.

In the afternoon of Day 1 removal, 5/23/05, USDA moved the Site #3 datasonde approximately 100 ft. to the east, where a new removal site was established. Occasionally during the operations at this site the workboat and screen drifted directly over the datasonde, giving high readings. USDA continued deploying the YSI datasondes to stay near the working sites.

In the afternoon of Day 1 removal, 5/23/05 around 3:00 p.m., Gretchen Gibson from TRPA visited the removal operations and reviewed the permit conditions on site. She suggested certain adjustments be considered, such as adding a catch box or silt curtain, for reducing the heavy silt drift from the screen box. Before starting up the following day,

ACE fastened an 8-foot wide sheet of black plastic around the screen box. Figures 8 and 9 show the demonstrable differences in silt movement observed from water surface, without and with the silt curtain, within 5 feet from the screen box. With such measurable benefit, the CSLC believes the use of a silt curtain should be required when vacuum assist dredging is used in Lake Tahoe.

IV. RESULTS

A. Biomass Removed ACE removed all EWM detected from the primary infestation areas, Sites #3 and #2, and no Eurasian watermilfoil was found at Site #1. All told, the three-day effort removed 64.13/ 9.5 pounds fresh/ dry weight EWM plants collected, total fragments for Day 1 estimated at 12 ounces fresh weight, within five 17-gallon plastic bins of material, or less than 85 gallons volume, equivalent to (the volume of a large garbage can) 11.4 cubic feet or 0.42 cubic yards

From observations of the collected material removed from the screen box, CSLC staff estimated that the collection consisted of approximately 10% of mixed non-target plants, mostly native or hybrid milfoils, and some coontail. CSLC staff collected loose fragments during removal from a separate, dedicated boat, on the first two days of removal. The loose, floating fragments collected on Day 1 comprised 0.2% of the total wet weight removed for that day (0.3 lb. of 19.86 lb). A grab sample of 16 fragments taken on Day 3 averaged 4.9 inches in length.

All fresh collected plant material (5 plastic bags) was transferred, in two batches, to the USDA Aquatic Research Lab for analyses: two large bags (and one small bag of fragments) on the first day of collection, and three large bags on the last day. Plants transferred to the bins from the screen box were so heavy that no tarping or special covers were needed to prevent escape of plant materials while in transit to the home marina. ACE transferred all collected material to the USDA ARS Aquatic Weed Research Unit at Tahoe Keys Marina at end of day for transport to UC Davis for further analyses. Dr. Lars Anderson analyses are presented in a separate report (attached).

B. Water Quality

Day 1 USDA measured turbidity on Day 1 before initiation of, during and after removal activity by manual sampling and by datasonde at various locations and depths within 20 ft. from plant finds, expected diver activity, or the workboat. Turbidity before activity began was 1.2, and during removal turbidity ranged from 0.1 to 1.3 NTUs (nephelometer units): all but two values read under 1.0 NTU. USDA report Table 2b. presents data from logged sampling (20 min. intervals at ca. 1 meter from the bottom).

Day 2 Day 2 baseline turbidity measurement taken before initiation of removal read 1.1 NTU (nephelometer units) and 0.3 for Sites#3 and #2 respectively. During and after removal activity Site#3 ranged: 12:30 1.0 NTU, 14:00 0.1 NTU, and 14:25 0.4 NTU. Site Site#2 read 0.4 NTU at 15:00, end of removal. The USDA report presents these data.

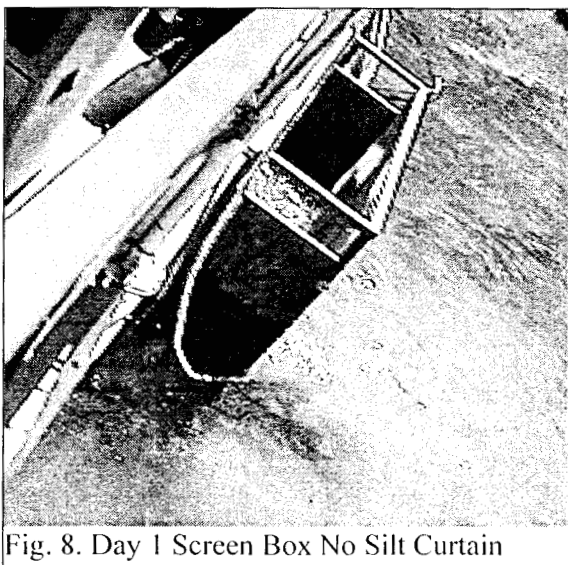


Fig. 8. Day 1 Screen Box No Silt Curtain

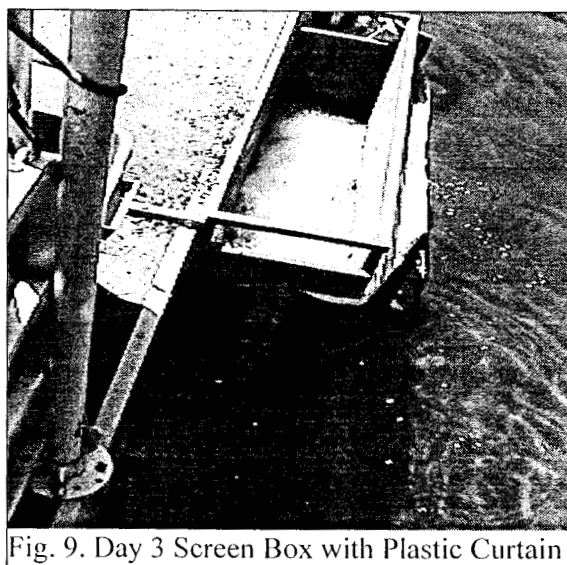


Fig. 9. Day 3 Screen Box with Plastic Curtain

Day 3 Turbidity measurements were taken on 5/25/05 before startup at a background of 0.5, 0.7 NTU. Almost one hour into removal, turbidity measurements read 1.8 and 0.9 NTU approximately 10 feet from the collection screen. Final readings were close to baseline, 0.7 and 0.5, respectively. Subsequent removal in the swimming area showed a reading of 0.1 NTU with a finished reading of 0.4 NTU.

V. DISCUSSION

- A. Eurasian Watermilfoil Biomass** Although informal reports were of extensive aquatic vegetation in Emerald Bay, ACE's underwater survey detected far less material than originally estimated. Historical quantitative data have not been readily available from previous surveys, and some prior surveys did not use underwater surveillance. Earliness of season likely contributed to the low Eurasian watermilfoil biomass, and regrowth from missed and new Eurasian watermilfoil plants is expected to be relatively small, as will be determined from a follow-up survey and inventory of plants in Emerald Bay in the fall 2005.

Hand removal, perhaps the oldest method of treating shallow-rooted aquatic weeds, achieved greater than 85% cleanout on this small infestation. However, hand removal is feasible only on smaller scale management/ prevention programs such as this. Historically, smaller marinas and boat-launch facilities have been able to use this technique extensively with pioneer Eurasian watermilfoil colonies, given favorable conditions and promise of worthwhile benefit for the relatively high cost. To date all marinas and piers in Lake Tahoe, except for the Tahoe Keys Marina, have light infestations, so currently the diver hand-removal technique would be useful. On the fall survey in Emerald Bay, CSLC would like to measure

the differences between diver hand-removal, vacuum-assisted, and no vacuum assist.

For larger, more dense infestations, integrated use of other tools, including bottom barriers and low impact chemicals of proven low aquatic and mammalian toxicity, in a well-timed approach, would be the most effective, feasible approach to the root problem of high biomass uncontrolled by any other means, and should be explored, at least on a pilot basis.

- B. Disposal** With such low total biomass in the Bay, high water content averaging 85% of fresh weight, and low nutrient content, the pulled plants of small quantities of less than 50 pounds fresh weight may be easily dispatched to local disposal modes, i.e., 50 gallon garbage cans, or mulching grounds. Since flowers/ seeds have not been observed on Lake Tahoe Eurasian watermilfoil plants, the threat of spread from seeds or turions is negligible, especially when compared to the relative risk of the ongoing spread of fragments by boats and jet skis. A small study to examine for seed or turions from all plants collected from Lake Tahoe may be worth consideration. In developing a low-impact disposal method, CSLC recommends consultation with Drs. Kurt Getzsinger of ACOE Waterways Experiment Station and John Madsen of University of Mississippi for quarantine assessment and guidelines to use for safe handling of collected plants.
- C. Effectiveness** Data from follow-up survey should confirm a high level (greater than 85%) of removal. The occurrence of low plant frequencies and densities warrant an annual, low-impact, maintenance control program. Use of this method, even by itself, can be easily developed and should be put into practice. CSLC recommends that an integrated vegetation management program, in which all other feasible methods and their careful timing are examined, is considered.
- D. Impacts**
1. **Turbidity** USDA continuously measured turbidity at several waypoints within Emerald Bay. Temporary turbidity spikes occurred at the two high sediment shakeout points: 1) just above the substrate where plants were being pulled out, and 2) just below the water surface within a 5-foot radius from the workboat collection box. Very few turbidity readings ever exceeded 3 NTU, the Lahontan RWQCB Basin standard, although several measurements showed transitory values greater than 5% or 10% of the baseline NTU values. Also, on removal days all baseline values measured less than 2.0 NTU, hence any turbidity meter increment or decrement of 0.1 NTU, the limit capacity of the meter readout, even when taken on intervals in quiescent waters, or as a second measurement for baseline, differed by more than 5%. Please see the attached USDA report for detailed turbidity measurements and other water quality parameters.
 2. **Turbidity Standards** The applicable turbidity standards are uncertain, as guidelines for monitoring varied between TRPA and Lahontan. The most important effect measured was the improvement documented with the addition, on the second Day, of a silt curtain. For removal involving suction assist on over 100

square feet of submerged aquatic vegetation, the CSLC recommends use of a silt curtain. The CSLC would like to see an assessment of the effects of hand removal without suction assist, and a standardization/ modification of guidelines for the next round of removal.

3. Lakebottom Alteration The removal of the shallow-rooted Eurasian watermilfoil plants from Emerald Bay was not expected to alter the lake bottom in any measurable way. However, the CSLC applied for an Alteration Agreement in case unanticipated alterations to the lake bottom were to occur. It appears this may not be the case, especially since a low volume/ density of Eurasian watermilfoil was removed. Upon Site #3 reentry the day after removal, the determination where plants were removed was difficult. Selective removal, if in low mixed densities, does not create measurable "divots" in the hydrosol. Depending upon the density of the existing canopy, then, some thinning may open up space for native macrophytes to spread into, resulting in a slightly beneficial impact. For Emerald Bay in the fall, ACE will survey for plant mix and evidence of depressions from the May cleanout. For light Eurasian watermilfoil infestation removals in which this method is useful, a lakebed alteration permit does not appear necessary. With a low level of removal required in a maintenance control approach, and fewer permit requirements might be imposed and active lake-wide management lake-wide will appear more achievable.
4. Historical and Future Monitoring Data Historical turbidity monitoring data, if provided by the Tahoe Research Group would describe practical benchmarks for assessing impacts of suction assisted plant removal, or other techniques, such as diver hand removal without suction vacuum assist. The California Water Boards provide funds for such monitoring, and the Lahontan RWQCB might be able to support studies to compare the transient impacts of the data obtained on the suction assist versus the long-term recovery of beneficial uses, in order to develop reasonable operating turbidity limits.

E. Costs

1. Operational For calculating the May 2005 removal costs, CSLC used only operational costs: the Diving Removal Contractor, for, one removal crew per day at \$1100/day, and use of out-of-basin Disposal Contractor (assuming \$150 per 6 yard bin) of \$900 for the 4-day effort. However, due to low Eurasian watermilfoil volume, the Disposal Contractor was not used.

Unfortunately, this reasonable cost of removal does not apply to high, dense EWM volumes, because high biomass renders the technique ineffective.

Table 2. COSTS

AGENT	TIME	COST (\$)
A.C.E.Diving	1 crew 4 days	\$4950
Disposal Company*	6-yard bin per day, X 5 plus delivery	\$900 *Not used this event
	TOTAL	\$4950
IN-KIND STAFF COSTS		
CSLC	>120 hours	>\$10,000
USDA ARS Aquatic Lab	Turbidity Monitoring, 3 staff, 3 days, travel	> \$4500

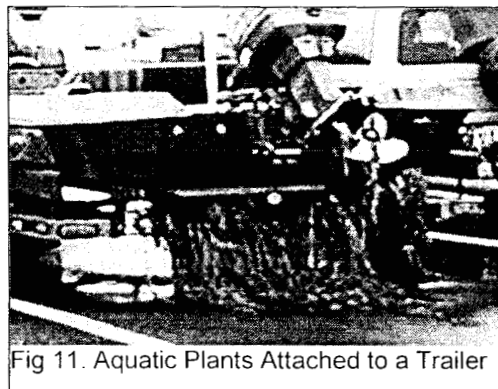
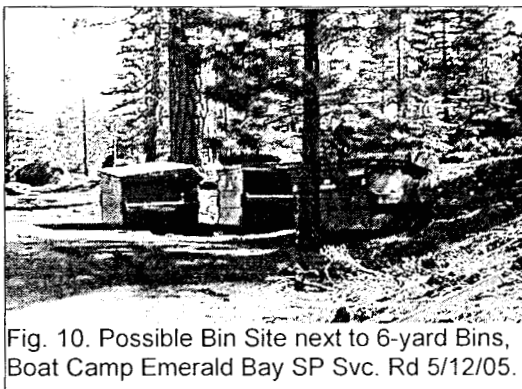
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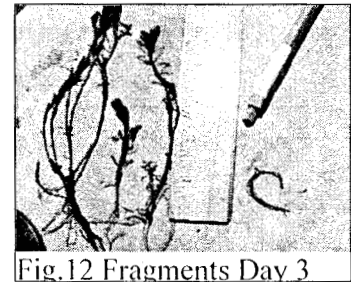
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2. In-Kind Staff Costs By far the greatest cost incurred was for the time and cost in preparing the permit documentation requested by the TRPA, Lahontan RWQCB and CDFG, and logistics from the upland owner, CDPR. All agencies dedicated appreciable resources. CSLC staff expended over 120 hours in obtaining the necessary permissions to enable this small pilot effort, hence the capital outlay for a "one time only" permit was excessive. The USDA contribution to this pilot, turbidity monitoring, worth over \$4,500, was also excluded from operational cost calculations.
3. Flexibility Several permit conditions constrained this project, as some of the terms did not match well to the conditions encountered. CSLC provided detailed descriptions in response to fulfill specific requests by the permitting agencies, using much time in their preparation, all told, over 120 hours. Adapting some project description to particular requirements was difficult: field detection and pull-out work is opportunistic, and CSLC staff used conservative numbers to allow flexibility for a broad range of possibilities. The conservative estimates incurred restrictive provisions that, with the new data, should be adjusted to match more to actual handle of material. The CSLC recommends consideration of a memorandum of understanding that would allow flexibility on certain requirements of issue, yet keep the exchange of data to inform all and if possible, encourage participation in the field assessment to better administer the project.
- a. For example, CSLC was requested to submit a photograph of where the target disposal bin would be placed in the upland State Park, though the Project Description described that it would be sited at a mutually agreed site (thought to be near where several other dumpster bins were already in place). To meet this request, CSLC staff scheduled an additional day to drive to the site and photograph (8 hours counting the CDPR staff time to open the gate and walk the intended site (Figure 10.) to submit with the application. Biomass removed the first day was so low that disposal to a 6-yard bin was not used at all.
- b. Another permit condition allows only for a one-time event, yet from the outset CSLC had planned fall follow-up to measure the level of control achieved. Hence the four-month follow-up will require a separate permit application. A new permit is required if any suction removal is to be performed. New submissions may take up to 4 months to process.



VI RECOMMENDATIONS

Follow-Up With Same Technique-- Emerald Bay -- Fall, 2005



CSLC staff recommends that:

1. ACE revisit Emerald Bay in September or October 2005, to:
 - Survey and reassess level of control achieved from the May removal;
 - Remove and measure remaining/ new Eurasian watermilfoil plants. Plants missed in May likely would stand tall within the plant canopy and be more easily distinguishable from other macrophytes;
 - If completed within 2 days, ACE survey/remove Eurasian watermilfoil at other sites. The CSLC suggests Tahoe City Dam just above the flow into the Truckee River, entrance to Tahoe Keys Marina, and smaller infested sites, e.g., Meeks Bay, Ski Run Marina, or Tahoe City Marina;
2. Diver maintains turbidity within tolerable limits, using vacuum assist suction equipment with concurrent use of a silt curtain around the collection box;
3. The Tahoe Research Group provide historical data for turbidity monitoring from known Eurasian watermilfoil-infested marinas, with monitoring staff, Lahontan RWQCB and TRPA refining measurements of turbidity conditions, efficacy of the silt curtain, and explore soil types, conditions and turbidity rates in other marinas of known Eurasian watermilfoil infestations;
4. Examine options and rationales for different methods of disposal, and establish threshold volumes for different modes of disposal, consulting with USACE Waterways Experiment Station and University of Mississippi;
5. Resource managers initiate local studies for local composting analysis of impacts on large (Tahoe Keys) and small scale (diver pull-outs);
6. Responsible agencies and stakeholders meet as a focused Workgroup to discuss, with responsible agencies, what issues need to be addressed, how to inform and involve the public, what specific activities need to be conducted, and including specific permitting requirements and strategies towards developing a coordinated plan for integrated management of invasive weeds in Lake Tahoe;
7. Develop, with above, an education outreach component to inform and enable marinas and pier owners to manage submerged aquatic vegetation near their structures while minimizing adverse impacts to the Lake;
8. Conduct a preliminary study of the likelihood of spread from incoming and outgoing boats, and gather quarantine data i.e., solicit Tahoe RCD and California Dept. of Boating and Waterways support with signage prompting boaters to exercise housekeeping to minimize weed spread to and from other waters;
9. Conduct and initiate support for Lake Tahoe Divers Conservancy (TDC) to assist in detection surveys for invasive species lake-wide;
10. Assist TDC in obtaining permissions to survey, remove, map and manage invasive aquatic plants in Lake.

EXHIBIT B

EURASIAN WATER MILFOIL REMOVAL WORK PLAN FOR EMERALD BAY AND INITIAL PILOT STUDY OF BOTTOM BARRIER METHOD, LAKE TAHOE FALL 2006 AND SPRING/SUMMER 2007 CALIFORNIA STATE LANDS COMMISSION

PROPOSED WORK PLAN

To complete the initial pilot project conducted in 2005-06 and remove the remaining Eurasian watermilfoil (*Myriophyllum spicatum*) (milfoil), the CSLC staff is proposing additional survey and removal efforts in Emerald Bay, Lake Tahoe. The proposed work will be consistent with the previous project approved by the Commission and will comply with the current permits issued by the Tahoe Regional Planning Agency (Permit #20050562) and the California Department of Fish and Game (SAA #2005-0087-R2). The following provides a summary of the work plan for 2006 and 2007, which also includes a new pilot project investigating the use of bottom barriers to control milfoil.

1. Emerald Bay Removal Fall 2006 (\$5,000)

- a) The CSLC staff is proposing that additional survey and removal efforts be initiated in Fall 2006. As in the previous removal efforts, prior to initiating the survey and removal, the CSLC will implement the following work plan:
 - 1) Continue to work with California State Parks (Parks) to establish mutually agreeable dates to perform the survey and removal and commit to practices for safe access to the work site;
 - 2) Continue to inform TRPA, Lahontan RWQCB and CDFG staff of the intended dates of field work, and arrange for appropriate monitoring; and
 - 3) Schedule bin delivery and pick-up for collected wet plant material with South Tahoe Refuse, Inc.
- b) The CSLC Contract Diver (Diver) will remove the remainder of milfoil plants from Emerald Bay using the following protocols:
 - 1) Ensure that working equipment is thoroughly cleaned before entering the Lake, and that all equipment used is cleaned, after the end of the fieldwork, before moving it from the work area;
 - 2) Conduct an underwater survey:
 - Record all milfoil plants, noting any that are flowering or seeding;
 - Remove, upon discovery, individual EWM plants small enough for unassisted removal, placing them in collection, and recording their GPS coordinates;
 - Record infested site locations using GPS, in decimal degrees, and the Lake Tahoe Weed Coordinating Group weed reporting protocol;
 - Indicate on map contours the hydrosol most susceptible to milfoil invasion;
 - Identify any other aquatic plants present and note their relative location;
 - Provide CSLC at the end of the survey, a hand drawn map with GPS coordinates and a brief summary describing the areal extent of the infestation

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- with approximate square footage and density or numbers of plants in the area, GPS readings of detections, the locations where milfoil was removed, an approximate plant count or biomass (wet weight), and prioritization of work sites and tasks remaining for removal; and,
- Remove, based on prioritization, the denser, milfoil mats targeted for vacuum-assisted removal, and monitor turbidity or other water quality parameters as requested by the CSLC staff.
- 3) Submit to CSLC, within 14 days after completion of fieldwork, a report of work performed and the tasks completed. The report shall include:
- The areal extent of the infestation, the approximate area (square feet) cleaned, volume (in cubic yards or gallons, and wet weight) of material removed, and wet weight or count of fragments;
 - The level of control achieved and projected level of re-infestation or grow back;
 - The recommended follow-up actions and schedule that priority sites should be surveyed and removed;
 - The level of short-term and long-term control that is reasonably achievable; and
 - The recommended changes in procedures or control effort, and recommendations for new actions or techniques.

2. Emerald Bay Survey and Removal Spring 2007 (\$5,000)

In early summer 2007, the CSLC Contract Diver will conduct an Emerald Bay-wide detection survey to delimit the extent and density of the milfoil population from newly settled and carryover plants, following the procedures described above. Even after an intense level of plant removal, remaining sub-hydrosol plant remnants may regenerate, usually the following season. The bay-wide detection survey will confirm that no plants have established in the areas identified as non-supportive to milfoil. If the Contract Diver detects remnant milfoil plants, the Contract Diver will remove all remaining milfoil.

3. Initiate Bottom Barrier Technique Pilot Project (\$7,000)

Bottom barriers have proven to be a successful technique for suppressing milfoil and milfoil regrowth (Madsen, 2000). Specifically, a bottom barrier would be placed in an infested area of Lake Tahoe no larger than 3,000 square feet. Attachment A briefly describes the bottom barrier process. Surveys would be conducted at six-month intervals to compare the regrowth between the site with the bottom barrier and those sites where diver-assisted hand removal method was used.

- a) Before any installation of a bottom barrier, CSLC staff will:
- 1) Obtain authorizations from all pertinent agencies, specifically the Tahoe Regional Planning Agency (TRPA) and California Department of Fish and Game (CDFG);
 - 2) Work with the appropriate upland land owners to establish mutually agreeable work dates to perform the work and commit to practices for safe access to the work site;

- 3) Inform TRPA, Lahontan RWQCB and CDFG staff of the intended dates of field work, and arrange appropriate monitoring; and
 - 4) Contract a qualified Bottom Barrier Installer.
- b) The CSLC Contracted Bottom Barrier Installer will:
- 1) Conduct an underwater survey and measure off the area intended for barrier treatment;
 - 2) Record the site using GPS coordinates in decimal degrees where the milfoil infested area is covered;
 - 3) Install the barrier;
 - 4) Provide the CSLC with a map of the site specifying the GPS coordinates, landmarks, and any follow-up requirements (e.g., posting);
 - 5) Return at 6-months and again in 12 months to maintain the bottom barrier, make repairs, move benthic material, assess and report on its performance, and recommend future actions; and
 - 6) Within 14 days after completion of barrier installation or maintenance, send CSLC a report providing details about the bottom barrier installation and assessment of performance and maintenance, with recommendations for follow up actions.

4. Reporting

The CSLC staff will assemble the data from the studies, prepare interim reports providing results from the various activities, and submit them to the involved agencies.

5. References

Madsen, J.D. 2000. Advantages and Disadvantages of Aquatic Plant Management Techniques. Lakeline 20 (1): 22-34.

BOTTOM BARRIERS

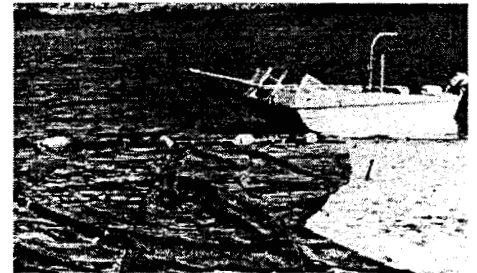
Bottom screens are reputed to control effectively (over 95%) most nuisance aquatic weeds around docks and swimming beaches, particularly on infestations that are too dense to be hand pulled, and on early infestations of various aquatic weeds, Eurasian watermilfoil. The process for a study of bottom barriers on submerged lands in Lake Tahoe would follow the process outlined below.

Description of Installation Process

Bottom barriers, also called bottom screening or benthic barriers, consist of the laying down and fastening of a durable, cloth-like material such as burlap or black plastic mesh, tightly over a lake bottom, pressing aquatic plants down to the substrate, and denying them light and the gasses to survive.

The installation will involve:

- Identification and delineation of the approved site to be covered.
- The Diver/Installer (Installer) will label and measure the site, including test plots (four 5' by 5') within the site and outside of the site, for controls, record the amount of aquatic vegetation on both sites, and photograph.
- Recommendations, based on the Installer's assessment of the site, best professional judgement, and the type of material and layout for that particular site. Other fabrics, e.g., perforated Mylar, woven synthetics, or felt-like polyester screens offer differing blends of durability, heaviness, light reduction, gas permeability, ease of installation and maintenance, all of which influence a barrier's success in controlling target weeds. Barrier material must allow gasses from decaying weeds to escape without billowing upwards. Even very porous bottom barriers billow up with gas and pose a hazard to navigation and swimmers. The key to ensuring low risk from these hazards is secure installation and vigilant maintenance of anchor tightness and barrier condition.
- The Installer will cut lengths and prepare grommets or attachment points for anchoring the barrier material. A thousand square feet can be laid down within 3-4 hours. The Installer may also use frames to attach bottom barriers and lay them over, rather than directly on, the substrate. The frames can be easily cleaned and moved to a nearby infestation, and be re-used for several seasons.
- After installation the Installer will photograph the site.



Bottom Barrier on Beach Before Installation

Monitoring

- The Diver/Installer will conduct two to four follow-up visits after installation to inspect barrier integrity, make adjustments to hardware, and evaluate progress in suppressing the target weeds, at six month intervals. If a site is determined to be free of the target weed, the Installer will pull material out and dispose of it appropriately.
- After the end of the bottom barrier treatment and monitoring, the Installer will summarize the effectiveness of the treatment. The summary will include a comparison of efficacy and cost compared to the diver-assisted hand removal treatment.